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(54) Title: SYSTEMS AND METHODS FOR AUTOMATICALLY SHARING INFORMATION AMONG REMOTE/MOBILE NODES		
(57) Abstract <p>Information is automatically shared among a plurality of remote/mobile data processing nodes which are temporarily and intermittently linked to a data processing server by distributing an information form to users corresponding to first remote/mobile nodes. A user may complete the form to create an instance of the form and define an instance distribution to users corresponding to the distribution list. The instance is automatically distributed to users corresponding to the distribution list. As owner of the form, the user may also modify the form, and these modifications are also automatically distributed to the users at the third node. A second form may be linked to the form and automatically distributed to the third nodes as well. When distributing a file to a node, any other files which are required are also automatically distributed.</p>		

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**SYSTEMS AND METHODS FOR AUTOMATICALLY
SHARING INFORMATION AMONG
REMOTE/MOBILE NODES**

Field of the Invention

This invention relates to data processing systems and methods and more particularly to systems and methods for linking a plurality of data processing systems for communication therebetween.

Background of the Invention

Since the early days of computing, data processing systems have been linked to users via communications networks. Initially, a host or mainframe computer was linked to user terminals. With the advent of the personal computer, "intelligent workstations" have been linked to host computers.

As more and more computing systems have become personal computer based, personal computers have been linked into Local Area Networks (LAN) which are managed by a server to provide client/server applications. These client/server networks can also be linked to mainframe and other computers.

Traditional LAN-based client/server networks, and most other computer networks, assume a near-ideal operating environment. In particular, LANs assume continuously connected users who are computer literate. Since the LAN connections between computers are hard wired, error-free reliable connections are assumed. Thus, the LAN-based client/server environment allows knowledge-workers and PC professionals to operate in a near ideal environment.

Unfortunately, traditional LAN-based client/server networks poorly serve the needs of important classes of users, referred to herein as "remote/mobile" users. As used herein, "remote/mobile" means "temporarily and intermittently linked", wherein temporarily means "lasting for a limited time" and

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which was specifically geared to remote/mobile environments. One or more RemoteWare servers can be connected to a LAN to control the exchange of information between a central site and hundreds or
5 thousands of remote/mobile computers and their users and applications. The RemoteWare server provides information management, resource management, scheduling, communication services, information monitoring and control services needed by large numbers
10 of remote/mobile users who are temporarily and intermittently linked to the remote/mobile network.

Communications between the server and the remote/mobile nodes are designed to keep connect time at a minimum. Thus, the connection cost is minimized
15 and the time that the transactional worker needs to spend connected to the central system are minimized. Moreover, the system is designed to support low bandwidth and unreliable connections.

RemoteWare Versions 1.0 - 1.4 include an
20 application which provides a remote transactional management system. The remote transactional management system, designated as "RemoteWare FORMS" includes a forms editor which is used to create forms with graphics, fields, text and bitmaps. Once completed,
25 the form becomes an application that can be assigned to a remote/mobile user's desktop. Once the form is assigned to a user's desktop, the system sends the form to the users to whom that user desktop is assigned. A forms node program displays the form at the node. The
30 node user enters the required information on the form. The node user then posts the completed form which is automatically sent to the RemoteWare server. If routing has been enabled for the form, the user may forward a data set to another user and sends copies to
35 others via a messaging service. The data may be viewed in the context of the form in which it was entered, and may be printed. The RemoteWare FORMS system is

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remote/mobile communications links are then disconnected from the first remote/mobile nodes.

An instance of the form is created at a second selected one of the first nodes by a user. An
5 instance of a form is a form into which information or data has been entered. For example, if the form is a customer profile form, a user creates a customer profile for a particular customer. An instance
10 distribution list is also assigned to the instance of the form in order to identify users corresponding to third remote/mobile nodes who need or may want to see copies. In the customer example described above, these users may be those sales force members who will interact with that customer. The instance distribution
15 list may be established by the user of the second node. Alternatively, it may be established at the server. A remote/mobile communication link is then established between the second node and the server and the instance of the form is transferred to the server, along with
20 the instance distribution list. The remote/mobile communications link is then disconnected between the second node and the server.

In response to receipt of the instance of the form from the second node, remote/mobile communications
25 links are automatically established between the server and the third remote/mobile nodes. A copy of the instance of the form is transferred from the server to the third remote/mobile nodes and the remote/mobile communications links are then disconnected. The
30 distributed instance appears in the recipient's in-box and is displayed upon selection. Accordingly, a copy of the instance of the form is automatically distributed to all remote/mobile users who have a need to know of the information contained in the instance of
35 the form and who are in the distribution lists as assigned by the form's instance creator. Multiple instances of the form may be created by multiple users,

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customer profile form. The form distribution list is automatically assigned to the second form so that the linked form is automatically distributed to the first remote/mobile nodes. Remote/mobile communications links are again established to the first remote/mobile nodes. The second form is transferred to the first nodes and the remote/mobile communications links are disconnected.

A user at a fourth one of the first remote/mobile nodes launches an instance of the second form while viewing an instance of the first form. The fourth node typically is not the same as the second node, but it may be the same node. The instance distribution list of the instance of the first form is assigned to the instance of the second form so that the linked instance form is automatically distributed to the recipients of the instance of the original form (i.e. to the third remote/mobile nodes). Remote/mobile communications links are then established between the fourth node and server, and the instance of the second form is transferred to the server. The remote/mobile communications links are then disconnected. Upon receipt at the server, remote/mobile communications links are established between the server and the third remote/mobile nodes. The instance of the second form is transferred from the server to the third remote/mobile nodes and the remote/mobile communications links are disconnected.

The above-described concept of ownership also applies to the linked form. Thus, the instance of the linked form can only be modified by the owner (fourth node). Upon modification by the owner, the modifications are automatically distributed to the third remote/mobile nodes.

Accordingly, information is automatically shared between groups of users in a remote/mobile communications network. Forms and linked forms are

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is not transferred until it is ascertained that the correct files reside at the node.

A probe is also used to determine whether all the information necessary is resident at a node. For
5 example, if an instance of a linked form is distributed to a node, a probe is used to verify that the linked instance of the original form is also present at the node. If not, the original instance is also distributed to the node. Accordingly, all file
10 transfers will be accompanied by other files which are required for use with the transferred file, if the other files are not already present at the node. Transfers of files which cannot be used or which are not truly needed are thereby reduced or eliminated.
15 The probe technique can be used prior to any file transfer between the server and a node, in order to ensure that all required files are present at the node.

Brief Description of the Drawings

Figure 1 is a block diagram of a known
20 remote/mobile communications system with which the present invention may be used.

Figure 2 is a flowchart illustrating overall operations for information sharing according to the present invention.

25 Figure 3 is a flowchart illustrating operations for publishing a form according to the present invention.

Figure 4 is a flowchart illustrating operations for publishing a linked form according to
30 the present invention.

Figure 5 is a flowchart illustrating operations for completing an instance according to the present invention.

Figure 6 is a flowchart illustrating
35 operations for distributing an instance according to the present invention.

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operating environment and which runs RemoteWare Versions 1.0-1.4 marketed by the assignee of the present invention. RemoteWare Versions 1.0-1.4 act as the control point for information management, providing
5 the resource management, scheduling, communication services, information monitoring and control services needed by the remote/mobile network. RemoteWare Version 1.4 is described in a manual entitled
10 "RemoteWare SERVER Operations Guide, Software Release 1.4", Copyright 1992, XcelleNet, Inc., the disclosure of which is hereby incorporated herein by reference.

Remote/mobile servers 110 are linked to a remote/mobile communications network 120. Remote/mobile communications network 120 includes
15 various wire line connections such as switched analog, ISDN, and X.25 or wireless connections such as switched and digital cellular, satellite and radio frequency. Although leased lines and other permanent communication lines may also be used, these are not preferred due to
20 their high cost.

A large number (typically hundreds or thousands) of remote/mobile data processing nodes 116a-116f are connected to remote/mobile communications network 120. Each remote/mobile data processing node,
25 also referred to herein as a "node", includes a data processing unit which is temporarily and intermittently linked to server 110. Nodes 116 may include laptop computers 116a, personal computers 116b, MacIntosh computers 116c, point-of-sale systems 116d, pen-based
30 systems 116e and other remote LANs 116f. It will be understood by those having skill in the art that remote/mobile data processing nodes 116 may include any microprocessor driven units such as cellular telephones, personal digital assistants and other
35 workstations and terminals. Each node 116 preferably runs a node software program in background, and which operates in conjunction with the remote/mobile server.

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the first form, because the linked form shares information from the original form. The linked form uses the same distribution list as the first form, so that it is also automatically distributed to the first nodes. Figure 11 is an example of a Current Encounter Form which is linked to the form of Figure 10.

Still referring to Figure 2, at Block 500 a receiver of a form, for example a user at a second node selected from the first nodes, may produce an instance of a form by entering data into the form. The originator of the instance becomes the owner of the instance. In the Example of Figure 10, the owner of the form, and of instances of the form, may be the "Patient Records" department of the HMO. A new instance is created for each new patient. The instance is distributed to all health professionals in the HMO group who might deal with the patient. The linked form of Figure 10 details a patient encounter. Each time the patient is "encountered" the health worker selects "Encounter Information" on the form of Figure 10 to launch the linked form of Figure 11 which is completed and shared. There can be, and usually are, several Current Encounter forms for each patient.

At Block 600, the instance is distributed to users on an instance distribution list, which identifies users at third nodes selected from the first nodes. The instance distribution list may be set up by the user at the second node or by the system administrator at the server. After distribution, a recipient of the instance may view the instance at Block 700.

Instances may be modified by the owner at Block 800. Only the owner can modify the instance. Upon modification, the modifications are automatically distributed to the third nodes using the instance distribution list. Upon receipt, the modifications overwrite the data at the third nodes.

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sole purpose of transferring the form. Alternatively, the form may be transferred during a remote/mobile session which is periodically established, or established to accomplish other tasks. The

5 establishment of a remote/mobile link between the node and the server is well known to those having skill in the art and need not be described further herein. A preferred system for establishing a remote/mobile link is XcelleNet RemoteWare.

10 Referring now to Figure 4, operations for publishing a second (linked) form (Block 400 of Figure 2) will now be described. As already described, a linked form relates to the form described in Figure 3, now referred to as the first form. The linked form may
15 be published concurrently with or after publication of the first form. At Block 402, the second form is authored similar to Block 302 of Figure 3. At Block 420, the second information form is linked to the first information form. Information, such as names,
20 addresses or other identifiers, may be automatically transferred from the first information form to the second information form. The second form is also designated as being shareable

At Block 406, a decision is made as to
25 whether the same distribution list is used for the linked form as for the first form. Typically, the form distribution list for the first form is also used for the second form. However, the same list need not be used. If the same distribution list is not used, then
30 at Block 422 the linked form is assigned to a linked form distribution list.

At Block 408, the linked form is released similar to Block 308. At Block 410, remote/mobile links are established. The remote/mobile links are
35 established to the first remote/mobile nodes if the same distribution list is used as the original form. Otherwise, remote/mobile links are established with

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distributed. Accordingly, at Block 508, if the routing is selected by the user, the user assigns an instance distribution list to the instance of the form to identify users corresponding to third remote/mobile nodes. The same distribution list is used for an instance of an information (first) form and for an instance of a linked (second) form, so that an instance of the linked form is automatically distributed to the same users as the instance of the information form.

Typically, a selected node from the first nodes, referred to as a second node, will generate the instance of the first form, and another selected node from the first node, referred to as a fourth node, will generate the instance of the second form. Of course, the same node may originate both instances.

At Block 510, a remote/mobile link is established with the server and the completed instance is transferred to the server at Block 512. At Block 516, if the user has selected a distribution list, then the instance distribution list is also transferred to the server. The remote/mobile link is then disconnected.

Referring now to Figure 6, operations for distributing an instance of a form (Block 600 of Figure 2) will now be described. It will be understood that these operations are performed to distribute instances of information forms to third remote/mobile nodes and instances of linked forms to the third remote/mobile nodes.

At Block 602, a determination is made at the server as to whether archive of the received information is required. If yes, the instance information is stored in database 112 (Figure 1) or in another database. Storage in the database permits querying of the database using known database querying programs. Accordingly, the database 112 may include a

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Detailed operations for probing a node will be described in connection with Figure 9.

Referring now to Figure 7, operations for viewing an instance (Block 700 of Figure 2) will now be described. Upon receipt of an instance at a third node, an instance identifier appears in the node's in-box at Block 702. The instance identifier may be any kind of message, icon or other indicia to indicate to the user that a new instance has been received. At Block 704, the user selects the instance for viewing, and at Block 706 the instance form is displayed. At Block 708 a linked form may be launched as described above.

Referring now to Figure 8, operations for modifying a form (Block 800 of Figure 2) will now be described. Only the owner of a form, i.e. the originator of the instance of the information form (second node) or linked form (fourth node), may modify the form. Also, only the modifications are automatically shared to thereby decrease the remote/mobile communications time.

At Block 802, in order to modify a form, a owner changes data on a form. For example, a new address or contact point may be provided for the form. At Block 810, a remote/mobile link is established, and at Block 804 the modifications are transferred to the server. The remote/mobile communication link is then disconnected at Block 814.

Once received at the server, a test is made as to whether the user who has modified the form is the owner (originator) of the instance of the form. If not, an error message may be sent at Block 822, informing the modifier that he is not the owner of the form, and that the form can be modified by sending a separate message to the owner of the form. The owner of the form may also be identified.

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not sent. However, if they do not already exist, they are sent. Accordingly, the probing technique minimizes remote/mobile connection time by (1) only sending files which are not already present at the node; and (2)

- 5 insuring that a file that is sent will be usable because all other required files will be present.

Referring again to Figure 9, at Block 902, when transferring a file to a node, required files are also identified. For example, when transferring
10 spreadsheet data, the files for the spreadsheet program itself are identified. As another example, when transferring instance data for a form, the file containing the form shell is identified.

At Block 904, a remote/mobile link is
15 established and a determination is made at Block 906 as to whether the required files are already present at the node. The determination may be made by sending a query to the node as to whether a particular file name is present at the node. If not, then at Block 908, the
20 required files are transferred. At Block 910, the file itself is transferred. At Block 912, the remote/mobile links are disconnected. It will be understood by those having skill in the art that the operations of Blocks 906, 908 and 910 may occur during separate
25 remote/mobile communications. Moreover, the file itself may be transferred before the required file. Accordingly, it is insured that the required files exist at the node, so that a transferred file may be utilized in its intended manner.

30 In the drawings and specification, there have been disclosed typical preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the
35 invention being set forth in the following claims.

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transferring said instance from said server
to said third remote/mobile nodes; and
disconnecting said remote/mobile
communications links between said server and said third
5 remote/mobile nodes.

2. An automatic information sharing method
according to Claim 1 further comprising the steps of:
placing a second information form on said
server;
10 linking said second information form to said
information form;
assigning said form distribution list to said
second form to identify said users corresponding to
first remote/mobile nodes;
15 establishing remote/mobile communications
links to said first remote/mobile nodes;
transferring said second form to said first
remote/mobile nodes;
disconnecting said remote/mobile
20 communications links from said first remote/mobile
nodes;
creating an instance of said second form at a
fourth remote/mobile node selected from said third
remote/mobile nodes;
25 establishing a remote/mobile communications
link between said fourth remote/mobile node and said
server;
transferring said instance of said second
form to said server;
30 disconnecting said remote/mobile
communications link between said fourth remote/mobile
node and said server;
establishing remote/mobile communications
links between said server and said third remote/mobile
35 nodes;

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transmitting the modifications to said server; and

transmitting the modifications from said server to said third remote/mobile nodes.

5 6. An automatic information sharing method according to Claim 5 further comprising the step of:
 replacing corresponding information in said instance of said form at said third remote/mobile nodes with the modifications.

10 7. An automatic information sharing method according to Claim 5 wherein said step of transmitting the modifications from said server to said third remote/mobile nodes comprises the steps of:

 determining whether said modifications
15 originated from said second remote/mobile node; and
 transmitting the modifications to said third remote/mobile nodes only if the modifications originated from said second remote/mobile node.

 8. An automatic information sharing method
20 according to Claim 2 further comprising the steps of:
 modifying said instance of said second form at said fourth remote/mobile node;
 transmitting the modifications to said server; and

25 transmitting the modifications from said server to said third remote/mobile nodes.

 9. An automatic information sharing method according to Claim 8 further comprising the step of:
 replacing corresponding information in said
30 instance of said second form at said third remote/mobile nodes with the modifications.

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transferring said form to said first
remote/mobile nodes;
disconnecting said remote/mobile
communications links from said first remote/mobile
5 nodes;
creating an instance of said form at a second
remote/mobile node selected from said first
remote/mobile nodes;
assigning an instance distribution list to
10 said instance of said form to identify users
corresponding to third remote/mobile nodes selected
from said first remote/mobile nodes;
establishing a remote/mobile communications
link between said second node and said server;
15 transferring said instance of said form to
said server;
disconnecting said remote/mobile
communications link between said second node and said
server;
20 establishing remote/mobile communications
links between said server and said third remote/mobile
nodes;
transferring said instance from said server
to said third remote/mobile nodes;
25 disconnecting said remote/mobile
communications links between said server and said third
remote/mobile nodes;
modifying said instance of said form at said
second remote/mobile node;
30 establishing a remote/mobile communications
link between said second node and said server;
transmitting the modifications to said
server;
disconnecting said remote/mobile
35 communications link between said second node and said
server;

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establishing remote/mobile communications links between said server and said third remote/mobile nodes;

transferring said instance of said second form from said server to said third remote/mobile nodes; and

disconnecting said remote/mobile communications links between said server and said third remote/mobile nodes.

10 14. An automatic information sharing method according to Claim 12:

 wherein said step of assigning a form distribution list to said form to identify users corresponding to first remote/mobile nodes is performed
15 at said server;

 wherein said step of assigning an instance distribution list to said instance of said form to identify users corresponding to third remote/mobile nodes is performed at said second node; and

20 wherein said step of transferring said instance of said form to said server further comprises the step of transferring said instance distribution list to said server.

 15. An automatic information sharing method
25 according to Claim 13 wherein said step of creating an instance of said second form at a fourth remote/mobile node comprises the steps of:

 viewing said instance of said form at said fourth remote/mobile node;

30 launching said instance of said second form at said fourth remote/mobile node; and

 completing said instance of said second form at said fourth remote/mobile node.

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determining whether said modifications originated from said fourth remote/mobile node; and transmitting the modifications to said third remote/mobile nodes only if the modifications
5 originated from said fourth remote/mobile node.

21. An automatic information sharing method according to Claim 12 wherein said step of transferring said form to said first remote/mobile nodes comprises the steps of:

- 10 identifying files which are required in order to use said form;
probing each of said first nodes in order to determine if the identified files are present at said first remote/mobile nodes; and
15 transferring the identified files from said server to said first remote/mobile nodes if the identified files are not present at said first remote/mobile nodes.

22. A method for transferring a first file
20 from a data processing server to a remote/mobile data processing node which is temporarily and intermittently linked thereto for communication therebetween, said first file transferring method comprising the steps of:

- identifying a second file which is required
25 in order to use said first file at said remote/mobile node;

probing said node during a remote/mobile communication between said server and said remote/mobile node, to identify whether said second
30 file is present at said remote/mobile node;

transferring said second file to said remote/mobile node during a remote/mobile communication between said server and said remote/mobile node, if said second file is not present at said remote/mobile
35 node; and

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means, responsive to said probing means, for transferring said second file to said remote/mobile node during a remote/mobile communication between said server and said remote/mobile node, if said second file
5 is not present at said remote/mobile node; and

means for transferring said first file to said first file to said remote/mobile node during a remote/mobile communication between said server and said remote/mobile node.

10 26. A system according to Claim 25 wherein said probing means comprises:

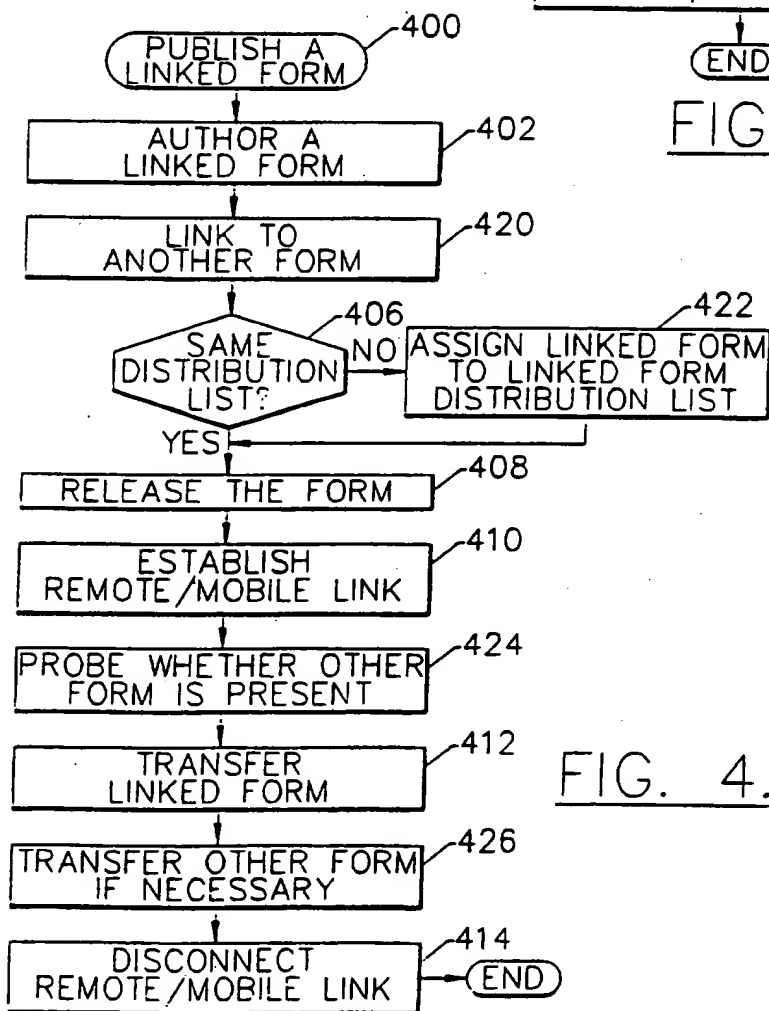
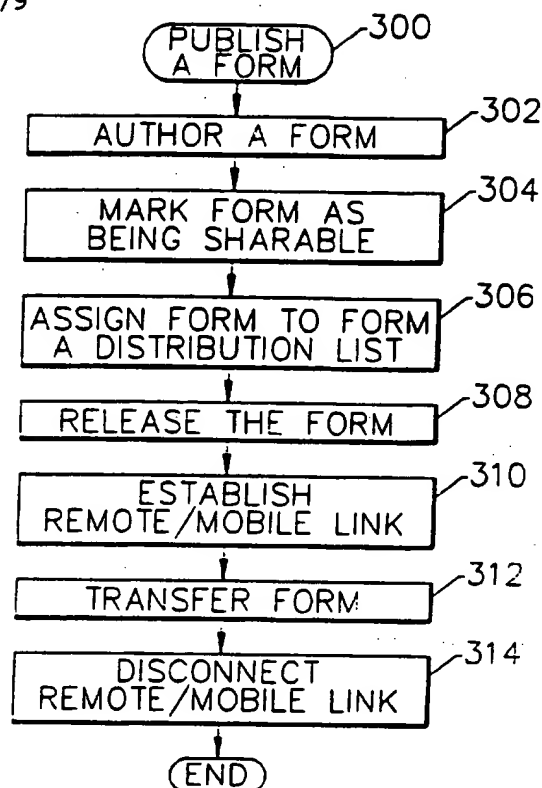
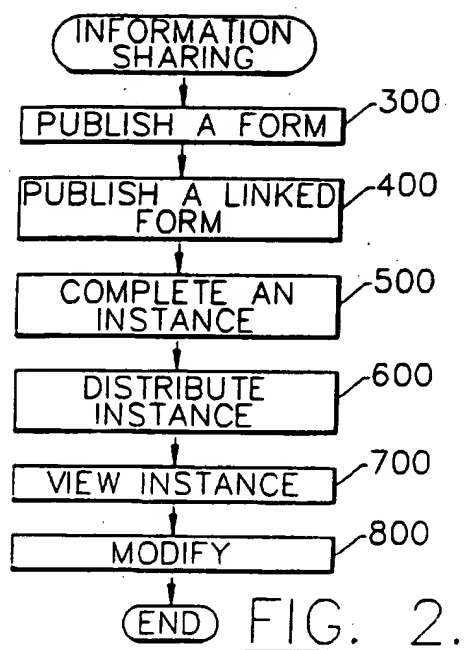
means for establishing a remote/mobile communications link between said server and said remote/mobile node;

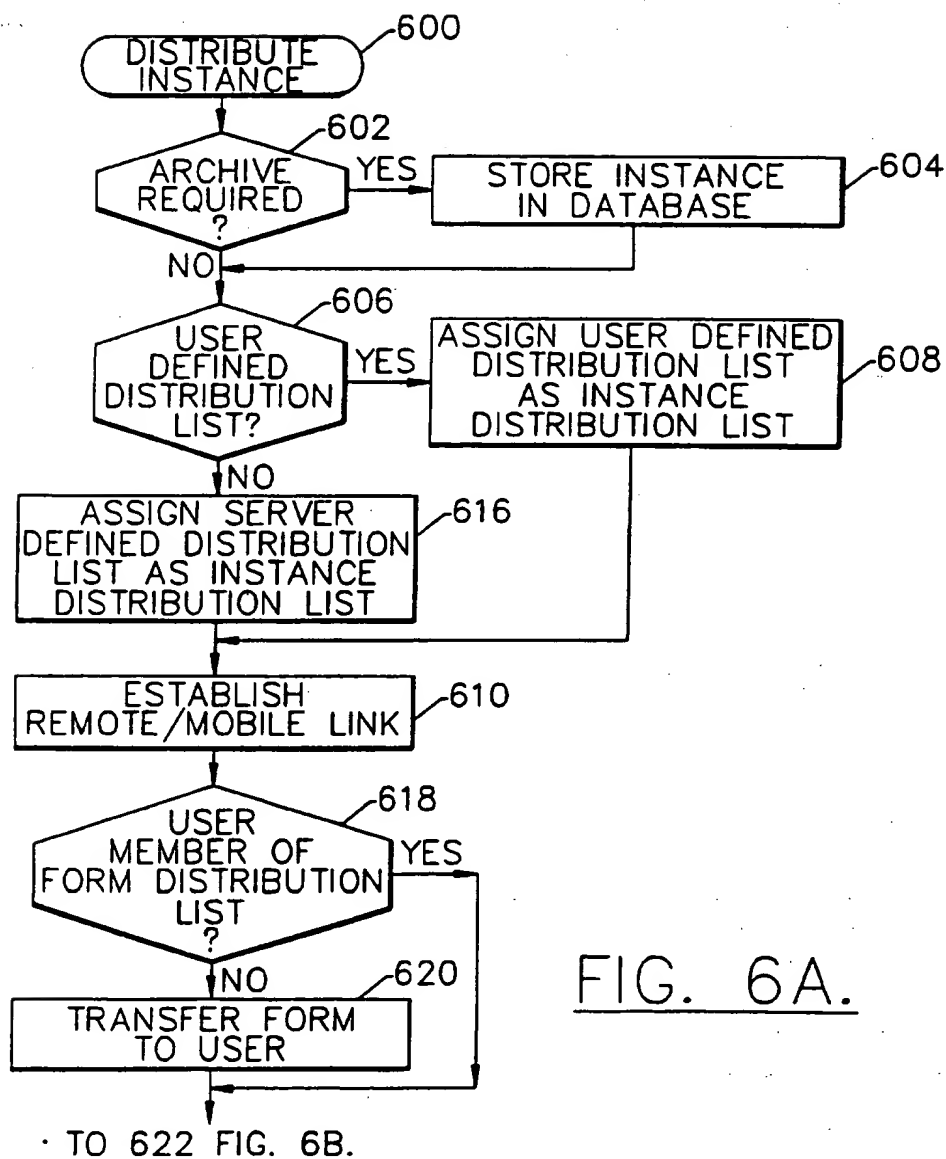
15 means responsive to said establishing means, for transmitting a message from said server to said remote/mobile node to determine whether said second file is present at said remote/mobile node;

means for receiving a response from said
20 remote/mobile node at said server, to indicate whether said second file is present at said remote/mobile node; and

means, responsive to said receiving means, for disconnecting said remote/mobile communications
25 link between said server and said remote/mobile node.

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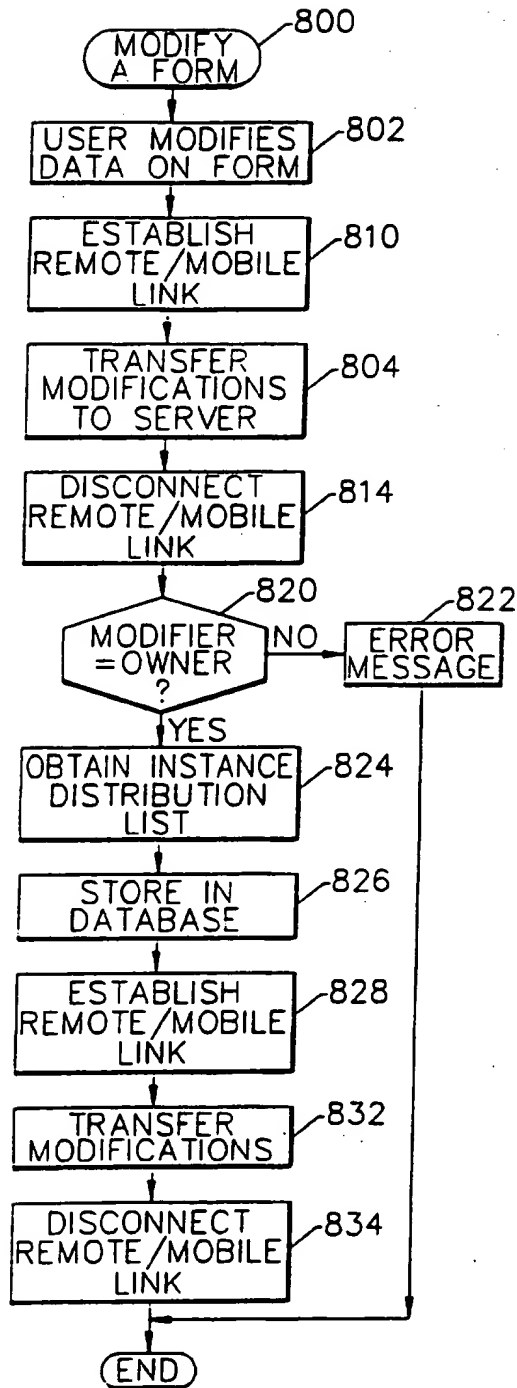


FIG. 8.

REMOTEWARE FORMS [HB_ENC2]	
PATIENT EDIT TABLE COMMUNICATIONS HELP	
PATIENT PROFILE & ACTION FORM	
HBO & COMPANY <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-around;"> + - ◀ ▶ ✓ ✗ x </div>	GENDER: FEMALE ACCESS TO RECORDS: COMPLETE ORESTRICTED PATIENT'S PRIMARY PHYSICIAN: DR. McCALL PATIENT ADDRESS: 4512 MORNINGSIDE ATLANTA, GA 30308 TELEPHONE: (404) 222-2222
ENCOUNTER INFORMATION	
ACTION REQUIRED <input checked="" type="checkbox"/> GET MEDICAL & INSURANCE HISTORY <input checked="" type="checkbox"/> RECORD ENCOUNTER INFO	ACTION RECORDS REFERRAL INFORMATION APPOINTMENT INFORMATION PATIENT RECORDS PATIENT MEDICAL HISTORY INSURANCE INFORMATION OTHER INFORMATION/NOTES
READY	
PATIENT [1 OF 1] SUCCESSFUL SESSION 12/01 09:45:14	

FIG. 10.

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